feature-set to the map. The program repeats the actions of 121, but does so in comparison with other symbols, images, or hilites currently displayed (see FIG. 4, Operation 603). If two symbols have the same coordinates or overlap, the program uses an algorithm to adjust the placement of the symbols so that all or part of both are visible, and determines which should be displayed on top of the other. If the topics use patterns, colors, or hilites as symbols, the program determines a third, combined pattern, color, or hilite to signify its representation of two attributes or for the overlap. For an "and" query, the program will hide previously visible symbols for features that do not have all the attributes. This action may be repeated to add other symbols; and keys for visible features may be clicked to hide their symbols.

Detailed Description Text - DETX (52):
    Two means of viewing annotational material about map features are possible. First, if the User points with the cursor (mouseOver) at a feature (symbol) on the map, 150, a message and label may be displayed (see FIG. 4, Operation 602). The program searches in the database and recognizes the feature associated with the x,y coordinate of the mouse location. If there is a message box on the map, the program displays text from the database in the message box of the map. If labeling is being used, the program reads the name for the feature from the name field. It calculates the size of the label based on the number of characters and the width of the font being used to size the label. It displays a label with the name next to the map symbol or in the slot; the label may have a line that connects the symbol to the label set at a distance to allow viewing of the area surrounding the symbol. A default location in relationship to the map symbol or slot determines its positioning. If the label would go outside of the map area or is too long for the slot, the program shifts it to an acceptable position. When the User moves the cursor away from the symbol (mouseOut) or clicks the symbol, the label is hidden, but the message box information may remain.

Detailed Description Text - DETX (53):
    Second, if the User clicks on a map symbol, 151, the program displays a hilite around the map symbol and a pop-up is displayed. The program searches in the database and recognizes the feature associated with the x,y coordinate of the mouse click (see FIG. 4, 604). If the row has pop-up annotations, the map symbol is hilited and the first pop-up card is assembled as described in the database (see FIG. 4, 305). The program calculates the quadrant or portion of the map within which the x,y coordinates of the map symbol are located. It then determines another appropriate quadrant or portion of the map over which the program will display the pop-up. It then replaces that quadrant or portion with an image that combines the shadowed pop-up edged by the visible map graphic surrounding the pop-up.

Detailed Description Text - DETX (54):
    The pop-up itself may be interactive. If the User clicks on a pop-up hot spot (a button, object, icon, or imagemap), 152, the pop-up is altered (see FIG. 4, 605). The pop-up displays additional information including links to other graphic and text data, animations, and sounds based on information in the

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TITLE: Graphic-information flow method and system for visually
                analyzing patterns and relationships

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Brief Summary Text - BSTX (4):
   Throughout the ages, humans have devised ways to record, then examine, their
thoughts and mental images on paper. People draw depictions of events, places,
projects, and sets of objects. They chart scientific processes, demographics,
weather conditions, and mechanical systems; and they diagram organizations,
trade routes, music, and inventions. These drawings aid both the originator
and subsequent audiences in picturing spatial or symbolic relationships. Paper
drawings and maps are representations of the real world; but often the viewer
must struggle to see only what is relevant amidst too much information.
Transparent overlays can separate graphic information, but are cumbersome and
restrictive. Reference documents such as catalogues, guide books, atlases, and
encyclopedias gather together images and text descriptions; but the user must
flip back and forth between pages to find, link, and compare information.

Brief Summary Text - BSTX (6):
   Computer graphics can be used to draw lines and shapes which may be
organized into layers for overlapping and for showing and hiding before being
output as a printed or digital illustration. CADD (Computer-Aided Design and
Drafting) is used to create plans of products, vehicles, buildings, utility
systems, and other three-dimensional objects. CADD employs layering technology
to draft and show different views of a three-dimensional object. A GIS
(Geographic Information System) plots data on a map with layers of points,
lines, and polygons representing land features. Each GIS feature has an entry
in a database with its name, a set of coordinates (which may be real-world
latitude and longitude) for positioning the feature on the screen, and
attribute data which may be shown in a separate window and queried to determine
a set of features to be displayed.

Brief Summary Text - BSTX (8):
   GIS (Geographic Information Systems) has come furthest in adding
interactivity to computer-generated images. Drop-down menus, graphics tools,
and palettes are used for customized map production; this slow, unwieldy
process is of very limited use for multi-faceted analysis. Networked GIS is
used within corporate and government intranets to provide staff access to data
displayed on geographic maps; it is also used on World Wide Web sites for the
public to find a street address or the location of one particular facility or
type of facility (see "Serving Maps on the Internet," by Christian Harder,

1998, Environmental Systems Research Institute, Inc., Redlands, Calif., incorporated herein by reference as if restated in full.) In addition to searching for addresses and facilities, the interactive capabilities of current online GIS include zooming in and out and panning within a large digital map file.

Brief Summary Text - BSTX (9):
   A typical GIS often also has a large database with thematic information for places on the map. However, current GIS does not provide for seamless access to subset combinations from extensive data sets. A legend, table of contents, or key shows a small selection of themes and the symbols associated with subsets within each theme. In some cases, entire themes may be shown or hidden by clicking a check box next to the theme title on the legend; however, a particular subset within a theme cannot be shown or hidden. Current online GIS interfaces rely on the scrolling of palette scroll bars to extend the legend and to view selections for queries; this scrolling breaks the flow of data selection and severely limits the organization and amount of data that can be accessed. Sometimes scrolling is also required to view the entire map and each subsequent iteration, further breaking the flow of the analytical thought process. An notational information, when available, is provided by going to a separate Web page or window; and thereby the material is not viewed smoothly, in direct association with the map feature.

Brief Summary Text - BSTX (10):
   Beyond layering software, another relevant computer technology is hypermedia. Hypermedia is the "linking" technology for instantly retrieving text, images, or sounds. Its "smart" graphics respond to commands such as mouse clicks to "hypertext" or to a "hot" symbol on the computer screen (often referred to as a button, object, icon, or imagemap).

Brief Summary Text - BSTX (14):
   CD-ROMs were the first major application of hypermedia because of the vast storage capability for graphics and sound. These files are linked to create multi-dimensional games, training materials, and reference sources. Current reference CD-ROMS are organized to incrementally access graphic and text information on a single subject, but are not presently designed to enable comparison and to enhance prolonged, dynamic visual analysis.

Brief Summary Text - BSTX (15):
   The second major hypermedia application is the World Wide Web. Presently, the technology favors lengthy text over graphics, and graphics are commonly used as small link buttons and illustrations rather than as the core data set. While searchable GIS maps and ecommerce shopping sites are growing to be among the popular image-intensive applications on the Web, the quality of their interactivity and usefulness for visual analysis and comparison is extremely low. A complex quest is constrained by the slow speed of the Web's current infrastructure and its standard presentation methods.

Brief Summary Text - BSTX (16):

For example, the Web's current accepted practice of presenting material is based on a page-to-page metaphor related to print magazines. The magazine-like vertical layout requires the scrolling of the page to accommodate the horizontal orientation of the computer screen. The page is made up of magazine-like article, illustration, and ad components. The eye roams from component to component, viewing each separately. Text is often lengthy. To obtain additional information, hypertext, symbols, drop-down menus, or query forms are clicked to call up an entirely new Web page. Often the new material is at a different Web site with a different format. The viewer attempts, with minimal success, to carry in the mind's eye the sequence of information, links, and pages. The viewer must build a mental model of the findings of their inquiry, instead of having this accomplished for them in the computer. It was this understanding and recognition of the problems with the prior art system that formed the impetus for the present invention.

Brief Summary Text - BSTX (25):

It is another object of the present invention to provide the ability to establish standard or common database formats whereby content-providers and users can submit data for display and comparison with other data. The data may be entered on a traditional database interface or with editing tools on an interface showing the relevant map or diagram.

Brief Summary Text - BSTX (29):

In accordance with the varying features of the present invention, the computer system includes supplemental, back-end, and user-tracking databases. The back-end database continuously or periodically gathers and stores new and changeable information so that the displayed information is always current. The user-tracking database tracks user events on the personal computer with the stored data used to return proper map data, to collect and archive data for the user, to provide data to a user's intelligent agent, and to prepare interactive map and diagram analysis reports on anonymous, aggregated user activity patterns.

Drawing Description Text - DRTX (8):

FIG. 4 provides a GUI/database operations diagram of the present invention;

Drawing Description Text - DRTX (15):

FIGS. 10a-b provide examples of a variety of map displays derived from the same database; and

Detailed Description Text - DETX (8):

The method and system employs what is sometimes termed "cognitive art"--visual representations that aid the comprehension of complex information sets. ("The Visual Display of Quantitative Information" 1983, "Envisioning Information" 1990, and "Visual Explanations" 1997 by Edward R. Tufte, Graphics

Press, Cheshire, Conn., incorporated herein by reference as if restated in full). The term "map" is most commonly associated with a flat, simplified representation of a landscape from above. A map can also be any visual portrayal of a geographic area or imaginary place including a cartographic, diagrammatic, photographic, perspective, or bird's-eye-view image or three-dimensional model. As well, a map can be a diagrammatic representation of a complex object (the human body, a vehicle, a building). A map can also graphically portray a topic for which a set of pictures or words are understood more clearly in a series of subsets and in relationship to each other (an organizational chart, a chemical sequence, or a set of scaled, color images of possible plants for the garden of different heights and flowering seasons).

Detailed Description Text - DETX (25):
   The graphic-information flow method and system for visually analyzing patterns and relationships is a computerized reference map system for assembling and integrating a set of materials about a place, topic, or thing in order to enhance the flow of information during the process of searching for knowledge and insight. A database-derived "map" displays representations of a place or a set of objects to be compared. This single, compact computer user-interface with layered indexes, keys, and content enables discrete sets of material from a dispersed network of large, multimedia databases to be accessed smoothly and repeatedly.

Detailed Description Text - DETX (28):
   The graphic-information flow method and system for visually analyzing patterns and relationships is realized through computer software. The present invention consists of template computer software for publishing a set of materials in a format that the user can smoothly browse. The software calls from a multimedia database to display a graphical user-interface (GUI) and alter it in response to user commands. The GUI has a central layered or slotted map area surrounded by control panels.

Detailed Description Text - DETX (29):
   The software employs "smart" graphics as symbols on maps and control panels. The graphics are "smart" in that they can be programmed to respond to user commands, calling to a database to cause an action. Users click control panel keys and query boxes to fill map layers and slots. Users point at and click "smart" graphics on the maps to call forth an notational text, images, sound, and video. Users at the back-end and front-end create, drag, reshape, reprogram, and otherwise change "smart" graphics with editing tools.

Detailed Description Text - DETX (30):
   The graphic-information flow system software template consists of GUIs (graphical user-interfaces), multimedia databases, and the software for configuring and operating the maps. The GUI is designed to permit operation on a variety of existing and future hardware devices; and the software can be developed using commonly available software languages, database programs, and electronic information systems.

Detailed Description Text - DETX (31):

Software on the server and client performs a number of functions. The template software enables customization of the database features, attributes, symbols, annotations, and topic organization; of the GUI layout; and of the animation and query configurations. GUI and database tools are provided for initial mapset creation and subsequent editing by authorized editors, dynamic databases, and public users. Software components include map and database interfacing; dynamic generation of graphics, imagemaps, and code; and user-tracking and activity-reporting. Directory and query box formatting automatically turns text lists into formatted top-layer graphics with retrieval bars and key extenders as necessary. The software uses "smart" graphics to provide for interactive keys and map features, map graphics layering and slotting, querying, and notation and publishing tools. The software also accommodates signaling from input/output devices such as GPS and adaptation to future input, output, and selector devices.

Detailed Description Text - DETX (33):

Five special control apparatus augment the index, key, and map configurations. First, message boxes within the map area show updateable text data. The message is typically: 1) the name and other tabular data for a feature in response to the cursor pointing to the feature, or 2) data for a set of features which is updated dynamically as time-sensitive information is changed in the database. Small message boxes also may appear as pop-up feature labels atop the map. Message boxes may be used for the viewer to type text input. Second, retrieval bars are used for switching information in indexes, keys, message boxes, and pop-ups. Retrieval bars use graphical or alphabetical segments that provide an improved alternative to traditional scroll bars. Third, key extenders revise control panel and message box content via overlays and pop-ups. Key extenders provide means for selecting additional feature attributes and for switching topics and sets of keys or message box contents. Keys are extended by clicking on topic titles or arrows. Fourth, query boxes, that may be in the form of key extenders or map area pop-ups, provide means for selecting multiple attributes for a complex query. A query is requested by clicking a button; and the results are returned by updating the map area. Fifth are user editing and publishing tools along with interactive how-to guides and tutorials that take new users through notation and publishing procedures.

Detailed Description Text - DETX (34):

Having the foregoing objects and functionality in mind, attention is now directed to a specific implementation of the invention. Referring now to FIG. 1a, the inventive system is first presented in functional block diagram form. Specifically, the system includes one or more workstations or other personal computer devices 10 with both local programming 11 and communication 30 to a remote server 20. This server includes additional programming 24 to assist operation and a central multimedia, relational database 21 and 22 containing a number of support databases stored in high capacity memory. Exemplar memory modules include Base memory 21 and Topical memory, 22. In this context, select

mapping elements commonly known as Base elements will be stored in the Base memory module and the Topical elements in the Topical memory module. As database entries, these elements are available for high speed delivery to each of the personal computer devices, either sequentially or concurrently, via the network link 30. A user-tracking memory module 23 stores data about each user's activity. To enhance this dynamic capability, the system includes an expanded link to the Internet or other network connections 50 so that the vast array of Internet or network source materials may be accessed and combined with the base and topical data of the central database and thus become available as information for mapping onto the selective two dimensional display. In addition to the role as a source for database information, the Internet and other network connections permits remote process control of the database content, including access and editing functionality via the personal computer devices 10. FIG. 1b shows alternative personal computer devices such as (a) high-resolution, large-scale, flat map display, (b) large-scale, wall-mounted display, (c) wireless, portable map and remote server, (d) portable, flexible, roll-up, flat map display, (e) portable, fold-up, flat map display, and (f) map expands and contracts as display is stretched or folded.

Detailed Description Text - DETX (35):
Turning now to FIGS. 2a-c, the system components are depicted in exploded view format. In these diagrams, arrows are used to indicate command and data flows. FIG. 2a depicts the primary command and data flow between the client and the server. To permit the seamless custom data flow to the presentation, the system display includes a map area 303 for imaging the map elements as recalled from the server 200. To control data selection and access, an interactive control panel with map keys 304 is displayed on a portion of screen real estate, with selections thereon governing the map area. When the User 301 causes a user-event such as a mouse click to the map or control panel, a sequence of software commands occurs reflected by the arrow to the Client-side Software 101. A browser program 101.1 parses the request and runs the client agent software 101.2 which may consist of HTML, Javascript, CGI, Java, ActiveX and/or other code. The client agent software processes the request and alters the map area image reflected by the arrow back to the display. If a complex query, additional graphic files, or updated information is required, the client agent sends a request to the server software 102 and multimedia relational database 200 that may reside on the client or across a network on another computer. This request triggers a sequence of events which gathers and assembles the graphic material on the server and sends it back to the client for display.

Detailed Description Text - DETX (36):
Importantly for the invention and as is discussed in detail in FIGS. 2b and 2c, elements comprising separate layers are stored in addressable databases, including central server files and databases 200 (comprising base 202 and topical 203 data sets, graphics files 204, and user-tracking database 404) wherein the grid depiction reflects data fields for each cell. The server software first uses a daemon 102.1 to report to the user-tracking system 404 in order to record the event and to retrieve relevant information about the history and state of user's map and any files on user preferences or from a

user's intelligent agent. The server software then calls a database access daemon 102.2 to query attributes as necessary and to look up in the databases 202, 203 such information as feature name, symbol, x,y location, z-layer, and annotation display data. The server then uses the results to determine which graphic files 204 to retrieve, how to plot and layer them, and how to reconfigure the interactivity of the graphics such as imagemaps (the areas of the map which respond to user events). The resulting GIF and imagemap coordinates and scripts are sent back to the client for display.

Detailed Description Text - DETX (37):

FIG. 2b represents the various system components. At the top, the two-dimensional information content of the display provided to the User 301 is depicted in exploded view as layers forming display content with the context of a geographic setting comprising elements such as rivers, streets, parks, etc. As can be seen, the layers are each characterized with select information that is of varying importance to the User. The base map elements are pulled from the base database 202 when the user first calls up the mapset. The User interactively turns additional layers of map data on and off to provide a more complete but concise data presentation via interactive control panel entries as described above in FIG. 2a. The topical database 203 provides content and display information for "smart graphics" 309 on topical layers 306, text in the message box 307, and pop-up annotations 308. The interactive "smart graphics" 309 on the control panels, base, topical, and pop-up layers are associated with user-triggered scripts and data in the databases which govern changes in the control panel and map area display in response to particular user input. Additional data is retrieved dynamically from secondary and third-party databases 504 at the back-end 502 of the system, passing through a security device 505. Content providers and editors 501 can alter content via back-end interactive map interfaces 503 that send graphics files and data to back-end databases and through security to the central server 200. The user-tracking system 402 enables aggregated user-activity patterns collected in the user-tracking database 404 to be viewed on a map interface 403 by system operators 401.

Detailed Description Text - DETX (38):

FIG. 2c depicts in exploded view a slotted-format display configuration in which base data is positioned in designated sub-areas of the map rather than via x,y coordinates as in FIG. 2b. This type of slotted-format can be used for any chart layout. In the illustration, a gridded base map 305 provides the containers for a set of "smart graphic" objects 309 to be compared. Upon calling up the mapset, the viewer 301 may use the control panels 304 to query the database for a selection of objects that meet certain criteria. Once these are displayed in the map area 303, common features of the objects may be selected via the control panel key for layering or hiliting 306. By pointing the cursor at a selected object or feature, the viewer requests text data to be retrieved from the database and displayed in the message box 307. By clicking on an object or feature, the viewer requests a pop-up annotation 306 about the object.

Detailed Description Text - DETX (39):

The graphic information flow system can display images representing any place, topic, or thing. Three types of map layout within GUIs (Graphical User Interfaces) are shown in FIG. 3. The layered map, 3a is used for sets of features with relative spatial locations that can be positioned by x,y coordinates. The slotted map has sets of discrete features positioned in a grid for comparison, 3b or in a chart with slots placed to represent features' relationships, 3c. Each layout starts with a base map and a control panel, 601. The user clicks the key to select one topic for display, 602. Also illustrated in 602, the user may point at a feature on the map to view text data in the message box. To compare features, the user selects from the key another topic or attribute subset for display and comparison, 603; this may be repeated to show and compare other topics; clicking the key topic a second time deletes that feature from the display. In 604, the user clicks on a map feature to view a pop-up annotation. The interactive pop-up appears in an area away from, but near the feature which is now hilited.

Detailed Description Text - DETX (40):

FIG. 4 shows the basic GUI/database operations that the database calls as a result of the GUI Input/Output sequences of FIG. 3. The Topical Database, 203 at the center of the drawing stores a set of feature and attribute data and is updated dynamically from the back-end interfaces, 503 and back-end databases, 504 at the top left of the drawing. As Users interact with the system, activity data is recorded and stored in user-tracking system, 404 and available for User activity reports, 403.

Detailed Description Text - DETX (41):

At the bottom of the drawing, a series of GUIs as seen above in FIG. 3c are shown. The broken lines indicate command sequences from the GUI to access the data via key "mouse" selection from the Topical Database, 203. In operation 601, the User "click" to topic "AA" on the control panel key, 612 alters the map display, 611 and displays that topic. Specifically, the system retrieves the source data from the topical database, 203 and determines the symbol, pattern, and color for "AA" attribute, 210. Thereafter, the system provides the slots or layers corresponding to the "AA" attribute, as indicated by the "X"s in the column headed by the "AA" designation, 214. All corresponding data items with the "AA" attribute, 214 are then placed on the Map area, 611.

Detailed Description Text - DETX (42):

In operation 602 of FIG. 4, the user points to one feature on the map to view text data about the feature. The software determines the slot or coordinate of the cursor and finds the slot designation or x,y coordinate in column 211 of the database, 203. The software retrieves the name from column 212 and text description of the feature from column 213. It displays this text data in the message box, 614 and/or the name in the label, 613, positioning the label near the feature.

Detailed Description Text - DETX (43):

In operation 603 of FIG. 4, another feature, "DD", is selected and this is used to find corresponding entries from the topical database, 203, as indicated by the "X"s in the column under the "DD" attribute. These features are then presented on the screen, available for User review.

Detailed Description Text - DETX (48):

Once the base map is displayed, the User will use the control panel key to select the first topic set for display on the base map. The User may first need to click on the key extender, 120 to revise the key in order to view the desired feature-set. The User clicks on a key symbol, 121, and the feature-set is displayed on the map. To accomplish this, the program searches in the database and recognizes the feature-set (layer) associated with the x,y coordinate of the mouse click (see FIG. 4, Operation 601). The program finds the column in the topical database for the requested feature-set. If part of the database is designated for symbols or a symbol is associated with the topic column, the program notes the symbol designated to represent the topic and finds rows with that column checked (see FIG. 4, 210). If part of the database is designated for images or "image" is associated with the topic column, the program notes which rows have an image. For each checked row, the program retrieves the symbol or image from the graphics file or cached images on the client and displays it at the designated x,y coordinate or in the designated slot, replacing the graphic of the base map.

Detailed Description Text - DETX (49):

If the symbol is not a rectangle, the program determines its shape. The shape may be a set of points for a line or polygon or a bitmap graphic with a mask. The program alters the map only for the area within the symbol. If the symbol (typically a shape or polygonal area) is designated as transparent, the program calculates the alteration of the underlying map colors within the area. For gridded slots each showing images of similar objects for comparison, the appropriate feature of the object is hilited. For layers or slots, a hilite may be an outline or filled shape; it may be opaque or a transparent tone altering the color of the underlying image.

Detailed Description Text - DETX (50):

If the User clicks on the same key symbol, 122, the feature-set is deleted on the map. The program repeats the actions of 121, but deletes the symbol or images by displaying the appropriate portion of the base map image (stored in the user-tracking database) in its place. If the User clicks on a symbol or label in a query box or enters text in a query box, 130, the feature-set is displayed on the map by another means; as follows. The program repeats the actions of 121, but searches for multiple columns to be checked or searches for text matches in a column. It displays a symbol, image, or hilite at the designated x,y coordinates or in the designated slot, replacing the graphic of the base map.

Detailed Description Text - DETX (51):

The User then will click another key symbol or query, 140 adding a new

feature-set to the map. The program repeats the actions of 121, but does so in comparison with other symbols, images, or hilites currently displayed (see FIG. 4, Operation 603). If two symbols have the same coordinates or overlap, the program uses an algorithm to adjust the placement of the symbols so that all or part of both are visible, and determines which should be displayed on top of the other. If the topics use patterns, colors, or hilites as symbols, the program determines a third, combined pattern, color, or hilite to signify its representation of two attributes or for the overlap. For an "and" query, the program will hide previously visible symbols for features that do not have all the attributes. This action may be repeated to add other symbols; and keys for visible features may be clicked to hide their symbols.

Detailed Description Text - DETX (52):

Two means of viewing annotational material about map features are possible. First, if the User points with the cursor (mouseOver) at a feature (symbol) on the map, 150, a message and label may be displayed (see FIG. 4, Operation 602). The program searches in the database and recognizes the feature associated with the x,y coordinate of the mouse location. If there is a message box on the map, the program displays text from the database in the message box of the map. If labeling is being used, the program reads the name for the feature from the name field. It calculates the size of the label based on the number of characters and the width of the font being used to size the label. It displays a label with the name next to the map symbol or in the slot; the label may have a line that connects the symbol to the label set at a distance to allow viewing of the area surrounding the symbol. A default location in relationship to the map symbol or slot determines its positioning. If the label would go outside of the map area or is too long for the slot, the program shifts it to an acceptable position. When the User moves the cursor away from the symbol (mouseOut) or clicks the symbol, the label is hidden, but the message box information may remain.

Detailed Description Text - DETX (53):

Second, if the User clicks on a map symbol, 151, the program displays a hilite around the map symbol and a pop-up is displayed. The program searches in the database and recognizes the feature associated with the x,y coordinate of the mouse click (see FIG. 4, 604). If the row has pop-up annotations, the map symbol is hilited and the first pop-up card is assembled as described in the database (see FIG. 4, 305). The program calculates the quadrant or portion of the map within which the x,y coordinates of the map symbol are located. It then determines another appropriate quadrant or portion of the map over which the program will display the pop-up. It then replaces that quadrant or portion with an image that combines the shadowed pop-up edged by the visible map graphic surrounding the pop-up.

Detailed Description Text - DETX (54):

The pop-up itself may be interactive. If the User clicks on a pop-up hot spot (a button, object, icon, or imagemap), 152, the pop-up is altered (see FIG. 4, 605). The pop-up displays additional information including links to other graphic and text data, animations, and sounds based on information in the

database (see FIG. 4, 216, 217). If the User clicks on a pop-up corner, 153, the pop-up changes to a new card. The program retrieves the next or previous pop-up card based on information in the database (see FIG. 4, 606). For written languages that read from left to right, clicking on the right corner calls the next pop-up card, and clicking on the left corner displays the previous card. This may be reversed for languages that read from right to left. Forward and back arrow symbols may be placed on the corners.

Detailed Description Text - DETX (57):

   User-editing, 170, is optional for public users; this is the process whereby authorized Editors add information via a password-protected back-end interface (see FIG. 4, 503). When an Editor or User clicks on a symbol tool in the control panel or in an edit or tools menu, a new symbol is created. A copy of the selected symbol is positioned on an appropriate place on the control panel or map. The new symbol is hidden and shown several times to call attention to it. When the Editor/User presses on the new symbol and drags to a position on the map, the symbol is moved. The symbol is repeatedly repositioned to the x,y coordinate of the cursor. If the cursor moves beyond the map boundaries, the symbol stays at the edge of the map. When the Editor/User releases, a row is added to a database with the symbol, an ID number, and its x,y coordinates.

Detailed Description Text - DETX (58):

   Authorized Editors' changes are entered in the base map or topical databases, as appropriate. For public users, the row is added to the user-tracking system database within a user-added layer associated with the User ID. A data entry dialog box appears in which the Editor enters name, message information, and pop-up data; this is optional for public users. When the Editor/User enters a name and other data and clicks "OK", the data entry dialog box disappears. The name and data are entered into the database row of the new symbol and then are called up when the User clicks a new symbol, 150, 151, 152. If the Editor/User does not press a new symbol or clicks "cancel" in the data entry dialog box, an alert message appears asking the User if they want to delete the symbol. If the User clicks "yes" or "cancel", the alert dialog box disappears and the new symbol is deleted. If "no", the data entry dialog box reappears. If the Editor/User clicks the delete-symbol tool and clicks on a user-added map symbol, a symbol is deleted from the map and the row is deleted from the database. An "Are you sure?" dialog may appear before doing so and the User may thereby cancel the deletion.

Detailed Description Text - DETX (59):

   Editing may also be done via a database interface. If the Editor/User clicks on "view database" in the control panel or in the edit or tools menu, the appropriate portion of the database appears in the map area. Any fields that may not be edited are grayed. The Editor/User may add rows and enter text in the database. The Editor/User may toggle between the database interface and the revised map to view and modify changes.

Detailed Description Text - DETX (62):

An exemplar GUI (Graphical User-Interface) layout and its components shown in FIG. 6a is designed to organize information from an extensive, complex data set. The special control apparatus maximize ease in retrieving subsets from the database. The navigation to the desired map can be accomplished via an optional index, 1-4, on the left by clicking on bar segments and list items. Retrieval Bar, 1, for switching categories of mapsets and Retrieval Bar, 2, for switching subcategories of mapsets call forth clickable lists of mapsets, 3, within the selected category and subcategory. The example shows a list organized in alphabetical order. Retrieval Bar, 4, is used for calling forth additional list information. The hilited segment designates the portion of the list that is displayed; clicking another letter calls up the portion of the list starting with that letter. Clicking on a map name in the list brings its base map into the Map Area. Orientation and navigation within a set of maps is accomplished via the Context Map, 5 in lower right, which shows the location of the present map within the next higher level map. Clicking outside its toned area, calls forth the next higher level map (zoom-out). Zoom-in capabilities, 5a, are provided via a key-accessed layer showing clickable zoom-in areas on the main map. Clicking on the "Home" icon, 6 upper right, retrieves the top-level map of the mapset.

Detailed Description Text - DETX (63):

Upon retrieving the desired mapset with its basemap visible in the Map Area, the user may click on the Topic Selector, 7, to retrieve site or object information for a particular topic in several ways. Clicking the underlined topic name will replace the base key with a topic-related key. Clicking on the box to the left of the topic name will call forth a query box in the key or as a pop-up (see FIG. 6b). Clicking on the down arrowhead will replace the topic list with a list of subtopics. The retrieval bar above the list shows the number of levels of topics and subtopics including and above the current subtopics list; clicking a segment will return to the higher-level topics list. Clickable keys are used to show and hide overlays to the basemap in the Map Area. The key, 8, shows a set of symbols; when a symbol is clicked, the software calls to the database to show all that type of site or object positioned properly on the map. Keys for additional types of site or object are accessed by clicking on the "next" and "back" arrowheads at upper right of key, 8a.

Detailed Description Text - DETX (64):

The central Map Area displays the content as sets of map symbols. Map symbols, 9, for sites and objects with information in the database are "hot." Pointing at a symbol will call forth into the message box, 10, the site/object's name and descriptive material. The message box is also used as a title bar to display the mapset title and subcategory title, 10a. Clicking on a map symbol will cause it to become hilited and a pop-up, 11, to appear in a part of the map other than that in which the symbol is located. The pop-up has interactive, annotational material about the site or object. The material in the pop-up may be presented on multiple cards that are retrieved via the segmented retrieval bar, 12, at the bottom of the pop-up. Special theme keys, 13, may be provided below the map. Sponsor name and message, 14, may also appear in this belowbar. Publisher, editor, and access to use, restrictions,

and other reference information, 15, may be located in the key or belowbar.

Detailed Description Text - DETX (83):

The interactive world map is also used as a directory to an extensive map
atlas. The world map can be clicked to zoom into regional mapsets; or the
index listing the map locations (to left of map) can be used (see FIG. 6a,
1-4). The index can be clicked to show other world maps; the retrieval bar at
its top can call up lists of continent, country, state, and region maps. In
this scenario, the user clicks "Travel Planning" on the topic index (to right
of map) and the related key appears below, shown in FIG. 7c. The user then
clicks "Travel Packages" in this key. FIG. 7d shows that a new control panel
has now replaced the key (it can be hidden by clicking the topic selector
"Travel Planning"). The>and<arrowheads in the key can be clicked to flip
forward and backward to view additional travel packages. The user has selected
a city of origin and a week by clicking on the up and down arrowheads. Symbols
then appeared on the world map showing available trips. Pointing at the Hawaii
map symbol has caused descriptive information to appear in the message box and
belowbar (below the map). Clicking on the belowbar>arrowhead would call
forth data on additional packages. Clicking on "View" would place interactive
descriptive maps, images, and text on top of the world map; clicking "View"
again would hide the description. Clicking on a continent name below the map
would call forth a continent map showing travel packages.

Detailed Description Text - DETX (85):

In FIG. 7f the user has clicked to zoom into a nature reserve and intersects
with the mapset and database of the naturalists studying the area. The visitor
can get a picture of what the hiking trails are like and learn about the
ecosystems. The scientists create and study the interactive maps to discern
relationships between various elements of the environment. In the example, a
biologist compares overlays showing the location of plants and animals to study
how they coexist. The biologist has selected specific insects and plants for
display via the categories at the top of the key. He has chosen to view only
the territory of one insect and one plant to study their interrelationship and
their relationship to the general land form. Numerous other layers can be
shown and hidden quickly via the key. In this way, only the set of material of
interest at the moment is viewed, without distraction of irrelevant
information. The biologist has clicked on the "Plant Species" key box to
access the database. The query box has appeared and is being used to identify
and map other species having certain criteria. The characteristics are clicked
on the list at the left of the query box and they appear as selections at
right. The retrieval bar at the bottom left of the query box calls forth other
choices. Once all criteria are selected, clicking on the "plot query" button
maps species that meet the criteria. A clickable list appears in place of the
key, FIG. 7g; the list can be hidden and recalled by clicking on the "Plant
Species" key label.

Detailed Description Text - DETX (86):

The results of the plant species query may also be viewed in a slotted map
by clicking on the "Grid" or "Graph" selectors in the key, 7g. FIG. 7h, shows

a comparable display for a selection of insects. This type of slotted map serves as a catalogue for viewing and comparing objects side by side. The interactive key enables further queries and the showing and hiding of features. The hilite capability can call out a particular common feature on each image (e.g., the thorax, the wing's subcosta vein) and may gray the rest of the image. The material in the slots may be layered to show cross-sections of things such as an insect's internal anatomy. An interactive pop-up, flip-thru storybook provides descriptive material about each object; note the subject-headed retrieval bar. The biologist views images of plants and insects collected in the study area along with those that have been archived. The biologist can also access via the internet other researchers' information on similar species from islands around the world. Over the years, a database is compiled from field investigations. Weather data is collected and updated dynamically from field stations. The scientists have used the back-end interface to add their research data via both a database interface and a map interface. The biologist views a chart of weather data, FIG. 7i, onto which can be layered time periods related to biological processes. He looks for cause and effect by studying the hatching of an insect, the blooming of a flower, and the patterns of sunny, rainy, and foggy days via the species key below and the pattern analysis key at right.

Detailed Description Text - DETX (89):
   FIGS. 10a and b show a variety of map displays derived from the same database. The components of the graphical user-interface of the present invention are depicted as active regions on the screen of a User's workstation, 1. In this context, the system provides frame components, including Map area (a), message box and pop-up label (b1 & b2), right control panel (c), bottom control panel (d), left control panel (e), corner control panel (f), and finally the pop-up storybook (g). A portion of a topical database is illustrated in 3; five examples of maps created from this same database are illustrated in 4-8: exemplary use of the framework components are provided in the slotted map (4), layered map (5), slotted and layered graph map (6), gridded matrix and use of pop-up storybook (7), and layered and slotted map with use of pop-up query box (8) for selective display of information relating to gardening. FIG. 11 shows an example of a three-dimensional model that can be rotated. With the addition of a topics list and key, it becomes a "map" and has feature and attribute data that can be shown and hidden, hilited, queried, and annotated.

Claims Text - CLTX (2):
   a. a database and associated software for storing, organizing, and retrieving data about elements and their attributes;

Claims Text - CLTX (9):
   1. display control panel(s) with graphic and text-list selectors that, in response to user events or automatic updating systems, call to the database to determine subset elements to be added and subtracted from the visual representation;

Claims Text - CLTX (15):
   a. Display control panels for receiving user commands and implementing a selective layering of data in the form of graphics, text and/or images onto a base presentation wherein said control panel includes control icons and text lists for manipulating the content of said selective layers in accord with user defined objectives;

Claims Text - CLTX (16):
   b. Database comprising one or more data elements for use in providing the substance to said layered data wherein said data elements are located in addressable memory in said database;

Claims Text - CLTX (17):
   c. Central display controller in communication with said database and said control panel for interpreting commands received by said control panel and directing the placement of data elements in accordance with a pre-programmed hierarchy; and

Claims Text - CLTX (19):
   6. The system of claim 5 wherein database further comprises database elements for supporting slotted map data for incorporation into said image data on said display.

Claims Text - CLTX (21):
   8. In combination in a display management system for displaying complex data elements relating to subjects wherein said data elements include three-dimensional graphics and/or images comprising:

Claims Text - CLTX (22):
   a. first database having a plurality of data elements on a subject and its graphic information, said elements are stored in volatile memory and said first database capable of being refreshed with current data from a second database;

Claims Text - CLTX (24):
   c. Communication means for linking said first database with said second database to provide for refreshed data elements therefrom; and